



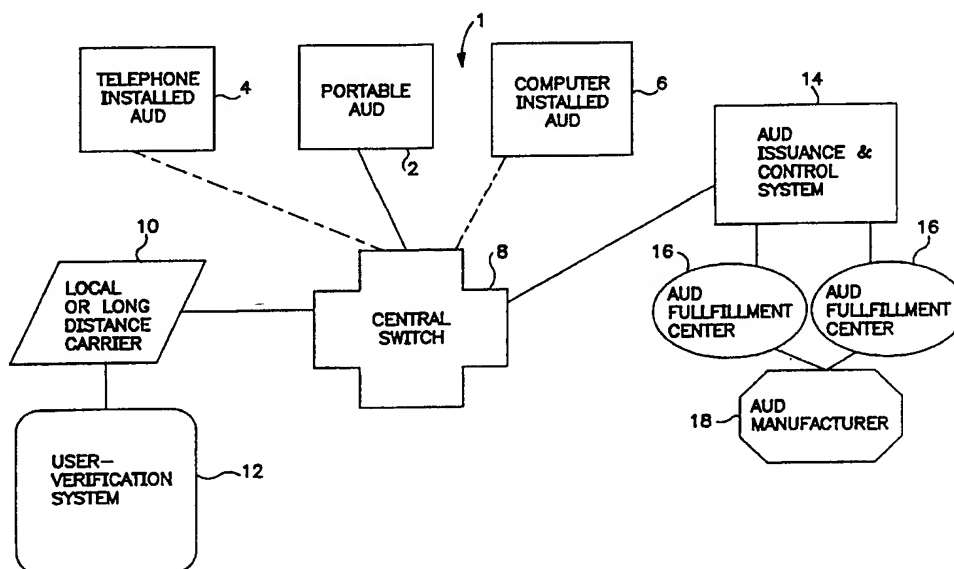
## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification <sup>6</sup> :</b> <b>H04M 3/38, H04Q 1/453, H04M</b> <b>1/274, G07F 7/10, H04M 17/02</b>	<b>A3</b>	<b>(11) International Publication Number:</b> <b>WO 97/31472</b>
		<b>(43) International Publication Date:</b> 28 August 1997 (28.08.97)
<b>(21) International Application Number:</b> PCT/US97/02907 <b>(22) International Filing Date:</b> 21 February 1997 (21.02.97)  <b>(30) Priority Data:</b> 08/606,151 23 February 1996 (23.02.96) US  <b>(71) Applicant:</b> SMART TONE AUTHENTICATION, INC. [US/US]; 205 West End Avenue, New York, NY 10023 (US).  <b>(72) Inventor:</b> MARK, Andrew, R.; 205 West End Avenue, New York, NY 10023 (US).  <b>(74) Agent:</b> LONGO, Robin, R.; Testa, Hurwitz & Thibault L.L.P., High Street Tower, 125 High Street, Boston, MA 02110 (US).		<b>(81) Designated States:</b> AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ARIPO patent (KE, LS, MW, SD, SZ, UG), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).  <b>Published</b> <i>With international search report.</i>  <b>(88) Date of publication of the international search report:</b> 3 September 1998 (03.09.98)

**(54) Title:** METHOD AND SYSTEM FOR THE SECURE COMMUNICATION OF DATA**(57) Abstract**

A user-authentication system includes an AUD for transmission of dtmf tones to a user-verification system over a telephone network. In a memory module of the AUD, voice and access data are stored for subsequent transmission to a user-verification system. A compensating system associated with the AUD generates two low frequency and two high frequency tones, and selectively amplifies them to varying levels to compensate for transmission efficiencies associated with conventional telephone microphones. The user-verification system further detects unauthorized users, and includes memory storing data relating to access numbers used,

and a user's voice, a transmitter transmitting a first signal requesting voice information and a second signal relating to time, a receiver receiving the tones and the signal relating to time, and an analyzer device determining whether the access number used to reach the user-verification system is identical to previous access numbers used, whether the signal relating to time corresponds to the time of user-transmission of the tones, and whether the user's voice corresponds to the stored data. A system for routing a tone signal from the AUD to an intended user-verification system includes a central switch receiving tones from the AUD including an initial alert tone followed by data tones representing voice-related and destination-related data. The central switch includes an analyzer device analyzing the tones, and a routing device routing the tones to a user-verification system in response to the alert tone. A system for performing amplitude equalization associated with each of the user-verification systems has a receiver receiving tones relating to a user's voice, an amplifier generating an amplification factor for each of the tones, and a correcting device using the amplification factors to correct subsequent voice tones.



**FOR THE PURPOSES OF INFORMATION ONLY**

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

<b>AM</b>	Armenia	<b>GB</b>	United Kingdom	<b>MW</b>	Malawi
<b>AT</b>	Austria	<b>GE</b>	Georgia	<b>MX</b>	Mexico
<b>AU</b>	Australia	<b>GN</b>	Guinea	<b>NE</b>	Niger
<b>BB</b>	Barbados	<b>GR</b>	Greece	<b>NL</b>	Netherlands
<b>BE</b>	Belgium	<b>HU</b>	Hungary	<b>NO</b>	Norway
<b>BF</b>	Burkina Faso	<b>IE</b>	Ireland	<b>NZ</b>	New Zealand
<b>BG</b>	Bulgaria	<b>IT</b>	Italy	<b>PL</b>	Poland
<b>BJ</b>	Benin	<b>JP</b>	Japan	<b>PT</b>	Portugal
<b>BR</b>	Brazil	<b>KE</b>	Kenya	<b>RO</b>	Romania
<b>BY</b>	Belarus	<b>KG</b>	Kyrgystan	<b>RU</b>	Russian Federation
<b>CA</b>	Canada	<b>KP</b>	Democratic People's Republic of Korea	<b>SD</b>	Sudan
<b>CF</b>	Central African Republic	<b>KR</b>	Republic of Korea	<b>SE</b>	Sweden
<b>CG</b>	Congo	<b>KZ</b>	Kazakhstan	<b>SG</b>	Singapore
<b>CH</b>	Switzerland	<b>LI</b>	Liechtenstein	<b>SI</b>	Slovenia
<b>CI</b>	Côte d'Ivoire	<b>LK</b>	Sri Lanka	<b>SK</b>	Slovakia
<b>CM</b>	Cameroon	<b>LR</b>	Liberia	<b>SN</b>	Senegal
<b>CN</b>	China	<b>LT</b>	Lithuania	<b>SZ</b>	Swaziland
<b>CS</b>	Czechoslovakia	<b>LU</b>	Luxembourg	<b>TD</b>	Chad
<b>CZ</b>	Czech Republic	<b>LV</b>	Latvia	<b>TG</b>	Togo
<b>DE</b>	Germany	<b>MC</b>	Monaco	<b>TJ</b>	Tajikistan
<b>DK</b>	Denmark	<b>MD</b>	Republic of Moldova	<b>TT</b>	Trinidad and Tobago
<b>EE</b>	Estonia	<b>MG</b>	Madagascar	<b>UA</b>	Ukraine
<b>ES</b>	Spain	<b>ML</b>	Mali	<b>UG</b>	Uganda
<b>FI</b>	Finland	<b>MN</b>	Mongolia	<b>US</b>	United States of America
<b>FR</b>	France	<b>MR</b>	Mauritania	<b>UZ</b>	Uzbekistan
<b>GA</b>	Gabon			<b>VN</b>	Viet Nam

# INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 97/02907

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 H04M3/38 H04Q1/453 H04M1/274 G07F7/10 H04M17/02

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 H04M H04Q G07F G10L G07C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 96 04741 A (MARK ANDREW R) 15 February 1996 cited in the application see page 24, line 30 - page 27, line 20 see page 35, line 15 - page 40, line 23 ---	1-10, 52, 53
P, X	WO 96 10880 A (LABATON ISAAC J ; KELLY MICHAEL K (US)) 11 April 1996 see page 6, line 12 - line 31 ---	1-10, 52, 53
X	DE 44 11 780 A (REDMANN WOLFGANG A DR RER NAT) 12 October 1995 see abstract ---	11, 12
X	US 4 679 236 A (DAVIES RICHARD E) 7 July 1987 see column 1, line 67 - column 2, line 6 see column 6, line 27 - line 29 ---	11
-/--		

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

\* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- "&" document member of the same patent family

Date of the actual completion of the international search

12 June 1998

Date of mailing of the international search report

26.06.98

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+31-70) 340-3016

Authorized officer

Vandevenne, M

# INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 97/02907

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 298 621 A (OLIVETTI & CO SPA) 11 January 1989 see column 6, line 27 - line 52	13,16,17
X	see column 2, line 30 - column 3, line 58  see column 5, line 28 - column 6, line 45 ---	23,24, 42-47
A	US 3 689 702 A (MCCAY THOMAS E) 5 September 1972 see column 1, line 53 - column 2, line 22 ---	18,21
A	EP 0 450 610 A (TEXAS INSTRUMENTS INC) 9 October 1991 see column 8, line 29 - line 58 ---	19,20,22
X	WO 93 13518 A (DIGITAL SOUND CORP) 8 July 1993 see page 6, line 4 - line 7 see page 21, line 1 - page 23, line 5 ---	23,24, 42-47
E	WO 97 12471 A (FINTEL S A) 3 April 1997 see page 7, line 16 - page 8, line 11 ---	23,24
X	WO 95 08821 A (VCS IND INC) 30 March 1995  see page 12, line 28 - page 13, line 25 see page 19, line 18 - line 32 ---	25, 32-35, 48-51
X	"SECURE ACCESS TO TELEPHONY PROCESSORS VOICE RESPONSE UNITS" IBM TECHNICAL DISCLOSURE BULLETIN, vol. 37, no. 6A, 1 June 1994, page 559 XP000455883 see the whole document ---	25, 32-35, 48-51
Y		26
Y	WO 94 22132 A (BRITISH TELECOMM ;PAWLEWSKI MARK (GB); TANG JOSEPH GORDON (GB)) 29 September 1994 see abstract ---	26
A	TOMOKO MATSUI ET AL: "A TEXT-INDEPENDENT SPEAKER RECOGNITION METHOD ROBUST AGAINST UTTERANCE VARIATIONS" SPEECH PROCESSING 1, TORONTO, MAY 14 - 17, 1991, vol. VOL. 1, no. CONF. 16, 14 May 1991, INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, pages 377-380, XP000245246 ---	26
	-/--	

# INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 97/02907

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	HANSEN J H L ET AL: "FOREIGN ACCENT CLASSIFICATION USING SOURCE GENERATOR BASED PROSODIC FEATURES" PROCEEDINGS OF THE INTERNATIONAL CONFERENCE ON ACOUSTICS, SPEECH, AND SIGNAL PROCESSING (ICASSP), DETROIT, MAY 9 - 12, 1995 SPEECH, vol. VOL. 1, 9 May 1995, INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, pages 836-839, XP000658124 ---	26
A	JANKOWSKI C R ET AL: "MEASURING FINE STRUCTURE IN SPEECH: APPLICATION TO SPEAKER IDENTIFICATION" PROCEEDINGS OF THE INTERNATIONAL CONFERENCE ON ACOUSTICS, SPEECH, AND SIGNAL PROCESSING (ICASSP), DETROIT, MAY 9 - 12, 1995 SPEECH, vol. VOL. 1, 9 May 1995, INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, pages 325-328, XP000657996 ---	26
A	PATENT ABSTRACTS OF JAPAN vol. 015, no. 131 (P-1186), 29 March 1991 & JP 03 013999 A (TOSHIBA CORP), 22 January 1991, see abstract ---	27
X	WO 93 21718 A (VCS IND INC) 28 October 1993 see page 2, line 29 - page 4, line 2 ---	29-31
A	EP 0 438 860 A (AMERICAN TELEPHONE & TELEGRAPH) 31 July 1991 see abstract ---	29
A	EP 0 568 114 A (FIRST DATA RESOURCES INC) 3 November 1993 see page 5, line 1 - line 52 ---	29
A	EP 0 453 831 A (TEXAS INSTRUMENTS INC) 30 October 1991 see column 5, line 25 - line 33 ---	31
A	EP 0 451 695 A (TEXAS INSTRUMENTS INC) 16 October 1991 see column 4, line 3 - line 29 ---	31
X	RABINER L R: "TOWARD VISION 2001: VOICE AND AUDIO PROCESSING CONSIDERATIONS" AT & T TECHNICAL JOURNAL, vol. 74, no. 2, March 1995, pages 4-13, XP000495041 see page 10, right-hand column, line 12 - page 11, left-hand column, line 32 --- -/--	36-41

# INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 97/02907

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 181 238 A (MEDAMANA JOHN B ET AL) 19 January 1993	
A	WO 92 17975 A (LITTLE & CO) 15 October 1992	

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 97/ 02907

## Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:  
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

### Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☒ No protest accompanied the payment of additional search fees.

# INTERNATIONAL SEARCH REPORT

International Application No. PCT/US 97/02907

## FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

1. Claims: 1-10, 52-53

Device and method for generating a series of tone signal pairs.

2. Claims: 11-17

User verification system comprising an analyser determining if received user signal characteristics include at least one of the signals previously transmitted to the user.

3. Claims: 18-22

Telephone communication system comprising a user activatable tone generator, transmitting a plurality of tones, comprising an initial alert tone followed by data tones.

4. Claims: 23-24, 42-47

System for performing signal normalization over a channel.

5. Claims: 25-28, 32-35, 48-51

Method of using a user authentication system to perform password sufficiency screening, prompting a user to state a passphrase.

6. Claims: 29-31

Method for performing user verification wherein a user is authorized in response to a match between a plurality of tone signals transmitted by the user ( and representing telephone numbers) and previously stored tone signals.

7. Claims: 36-41, 54 ,55

Method for performing user verification, adjusting a stringency requirement.



# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 97/02907

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9604741 A	15-02-96	US 5583933 A AU 3239795 A CA 2196784 A EP 0774189 A US 5745555 A US 5732133 A	10-12-96 04-03-96 15-02-96 21-05-97 28-04-98 24-03-98
WO 9610880 A	11-04-96	CA 2201758 A EP 0786184 A	11-04-96 30-07-97
DE 4411780 A	12-10-95	NONE	
US 4679236 A	07-07-87	NONE	
EP 0298621 A	11-01-89	DE 3886460 D DE 3886460 T JP 1049361 A JP 1958270 C JP 6093715 B US 4847885 A	03-02-94 16-06-94 23-02-89 10-08-95 16-11-94 11-07-89
US 3689702 A	05-09-72	CA 944495 A DE 2134125 A GB 1352212 A	26-03-74 13-01-72 08-05-74
EP 0450610 A	09-10-91	JP 5304567 A	16-11-93
WO 9313518 A	08-07-93	AU 3425093 A EP 0619913 A JP 7502834 T	28-07-93 19-10-94 23-03-95
WO 9712471 A	03-04-97	FR 2739235 A AU 7135296 A FR 2739513 A	28-03-97 17-04-97 04-04-97
WO 9508821 A	30-03-95	US 5517558 A AU 8011094 A CA 2172406 A EP 0746846 A	14-05-96 10-04-95 30-03-95 11-12-96

# INTERNATIONAL SEARCH REPORT

Information on patent family members

Int. l. Application No

PCT/US 97/02907

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9422132 A	29-09-94	AU 685788 B	29-01-98
		AU 6432994 A	11-10-94
		AU 6433094 A	11-10-94
		CA 2158847 A	29-09-94
		CA 2158849 A	29-09-94
		EP 0691024 A	10-01-96
		EP 0691022 A	10-01-96
		FI 954527 A	20-11-95
		WO 9422131 A	29-09-94
		JP 8508107 T	27-08-96
		JP 8508108 T	27-08-96
		US 5583961 A	10-12-96
WO 9321718 A	28-10-93	US 5315649 A	24-05-94
		AU 4103393 A	18-11-93
		CA 2118134 A	28-10-93
		EP 0636293 A	01-02-95
EP 0438860 A	31-07-91	US 5109408 A	28-04-92
		DE 69028384 D	10-10-96
		DE 69028384 T	23-01-97
		JP 3186048 A	14-08-91
EP 0568114 A	03-11-93	DE 3689652 D	24-03-94
		DE 3689652 T	01-06-94
		EP 0229170 A	22-07-87
		JP 2552469 B	13-11-96
		JP 63500138 T	14-01-88
		US 4792968 A	20-12-88
		US 5351285 A	27-09-94
		US 5359645 A	25-10-94
		US 5553120 A	03-09-96
		WO 8700375 A	15-01-87
		US 5561707 A	01-10-96
		US 5349633 A	20-09-94
		US 4845739 A	04-07-89
		US 4930150 A	29-05-90
		US 5128984 A	07-07-92
		US 5684863 A	04-11-97
		US 5014298 A	07-05-91

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 97/02907

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0568114 A		US 5109404 A	28-04-92
		US 5218631 A	08-06-93
		US 5048075 A	10-09-91
		US 5224153 A	29-06-93
		US 5365575 A	15-11-94
		US 5251252 A	05-10-93
		US 5259023 A	02-11-93
		US 5255309 A	19-10-93
EP 0453831 A	30-10-91	JP 5284203 A	29-10-93
EP 0451695 A	16-10-91	JP 5284228 A	29-10-93
US 5181238 A	19-01-93	CA 2013374 A,C	30-11-90
WO 9217975 A	15-10-92	AU 1756992 A	02-11-92
		US 5465290 A	07-11-95